World Health Organization Technical Report Series No. 8

WELLCOME INSTITUTE LIBRARY
Coll. welTROmec
Call No. palm WC750 1950 W92e

EXPERT COMMITTEE ON MALARIA

Report on the Third Session

WORLD HEALTH ORGANIZATION
PALAIS DES NATIONS
GENEVA

MAY 1950

Price : 2s. 3d $0.30

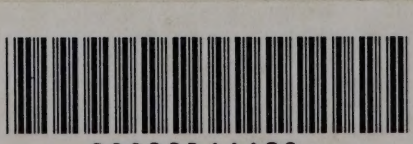
The World Health Organization (WHO) is a specialized agency of the United Nations and represents the culmination of efforts to establish a single intergovernmental health agency. As such, it inherits the functions of antecedent organizations such as the Office International d'Hygiène Publique, the Health Organization of the League of Nations, and the Health Division of UNRRA.

WHO had its origin in the proposal made at the United Nations Conference held in San Francisco in 1945 that a specialized agency be created to deal with all matters relating to health. In 1946, representatives of 61 governments met at the International Health Conference, New York, drafted and signed the WHO Constitution, and established an Interim Commission to serve until the Constitution could be ratified by 26 Member States of the United Nations. The Constitution came into force on 7 April 1948, the first World Health Assembly met in Geneva in June 1948, and on 1 September 1948 the permanent Organization was established.

The work of the Organization is carried out by three organs: the World Health Assembly, the supreme authority, to which all Member States send delegates; the Executive Board, the executive organ of the Health Assembly, consisting of 18 persons designated by as many Member States; and a Secretariat under the Director-General.

The scope of WHO's interests and activities exceeds that of any previous international health organization and includes, in addition to major projects relating to malaria, tuberculosis, venereal diseases, maternal and child health, nutrition, and environmental sanitation, special programmes on public-health administration, epidemic diseases, mental health, professional and technical training, and other public-health subjects. It is also continuing work begun by earlier organizations on biological standardization, unification of pharmacopoeias, addiction-producing drugs, health statistics, international sanitary regulations, and the collection and dissemination of technical information, including epidemiological statistics.

Expert committees are an essential part of the machinery of WHO, and their function is to give technical advice to the Organization. Members of such committees are " appointed by the Director-General, in accordance with regulations established by the Executive Board ". They are chosen for their " abilities and technical experience ", due regard being paid to " adequate geographical distribution ". Publication of reports of expert committees is authorized by the World Health Assembly or by the Executive Board.


22200144490

World Health Organization
Technical Report Series
No. 8

EXPERT COMMITTEE ON MALARIA

Report on the Third Session

Geneva, 10–17 August 1949

Page

1. Malaria and underdeveloped areas 6
2. Malaria therapeutics 7
3. Use of insecticides 17
4. Organization and planning 21
5. WHO malaria activities and perspectives 25
6. Conclusions and recommendations 39

Annex 1. List of corresponding experts, 10 August 1949 . . 44

Annex 2. Regulations of the Foundation for the Award of the Darling Medal and Prize 46

WORLD HEALTH ORGANIZATION
PALAIS DES NATIONS
GENEVA
MAY 1950

EXPERT COMMITTEE ON MALARIA

Third Session

Members :

Colonel M. K. Afridi, Director, Malaria Institute of Pakistan and Bureau of Laboratories, Karachi, Pakistan

Major-General Sir Gordon Covell, Adviser on Malaria, Ministry of Health ; Director, Malaria Laboratory, Horton Hospital, Epsom, Surrey, United Kingdom (*Vice-Chairman*)

Dr A. Gabaldòn, Chief, Division of Malariology, Ministry of Health and Social Welfare, Maracay, Venezuela

Dr P. F. Russell, Malaria Adviser, International Health Division, Rockefeller Foundation, New York, USA (*Chairman*)

Lieutenant-Colonel J. Singh, Director, Malaria Institute of India ; Additional Deputy Director-General of Health Services, Delhi, India

Professor N. H. Swellengrebel, Director, Institute for Tropical Hygiene, Amsterdam, Netherlands

Médecin-Général Inspecteur M. A. Vaucel, Directeur du Service de Santé colonial, Ministère de la France d'Outre-Mer, Paris, France

Dr D. B. Wilson, Director, East African Malaria Unit, Muheza, Tanganyika

Co-opted Members :

Dr G. R. Coatney, Chief, Section o Chemotherapy of Protozoal Diseases, Laboratory of Tropical Diseases Microbiological Institute, National Institutes of Health (US Public Health Service), Bethesda, Md., USA

Professor G. Macdonald, Director, Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, United Kingdom

Professor A. Missiroli, Chief, Parasitology Laboratory, Istituto Superiore di Sanità, Rome, Italy

Observer :

F. L. McDougall, Counsellor, Food and Agriculture Organization of the United Nations, Washington, D.C., USA

Secretary :

Dr E. J. Pampana, Chief, Malaria Section, WHO

The report on the third session of this committee was originally issued in mimeographed form as document WHO/Mal/32, 19 August 1949.

COMMENTS BY THE EXECUTIVE BOARD

The Board examined the report on 17 January 1950 and expressed its appreciation of the work done by the experts serving on the committee. The publication of the report, with the addition of its preface, was authorized; and, inasmuch as malaria is frequently associated with social and economic welfare, it was further recommended that it be communicated to the specialized agencies of the United Nations. Among the functions of the World Health Organization provided for under the Constitution is the strengthening of national health-services. It was emphasized that this should include the strengthening of antimalaria organizations in the relevant national administrations, so that countries may carry out and extend malaria control. Countries in which malaria is a major problem and where no adequate antimalaria organization exists are eligible to receive assistance from WHO in order to establish such an organization. In many countries, where antimalaria services have been adequately developed, the procurement of antimalarials and of insecticides, which must normally be bought with hard currencies, is frequently a handicap to the extension of operations and control. WHO is giving attention to the development of ways and means to assist governments in overcoming these difficulties.

If in malaria the final object is to be the elimination of the disease as a public-health problem, it is suggested that a useful incentive to the extension of control would be the publication of a pamphlet showing the dramatic reduction of malaria mortality and morbidity already achieved in several countries following residual-spraying campaigns.

At the First World Health Assembly, the Ukrainian Delegation proposed that a set of recommendations on malaria control be drawn up and submitted to governments of countries where malaria is present. These recommendations have now been drawn up by the committee and are endorsed by the Board, in the hope that they will be followed by the governments concerned. The Board draws attention to other points of importance in the report, including the statement concerning the respective value of quinine and of the modern synthetic antimalarials, and the recommendation that, wherever insecticide formulations are for sale to the public, their containers should indicate the technique to be used by householders in order to minimize the risk of injurious effects.

The protection of areas from which malaria-carrying anophelines have been eradicated, or which are naturally free from anophelines, has occupied

the attention of the World Health Organization since the First World Health Assembly ; and, besides the Expert Committee on Malaria, other expert committees have studied and are studying this question. The Board points out that it agrees with the committee in the view that the rigid antimosquito sanitation of sea- and airports is more important than any quarantine measures for the prevention of the introduction or reintroduction of the species.

EXPERT COMMITTEE ON MALARIA

Report on the Third Session [1]

The third session of the Expert Committee on Malaria of the World Health Organization took place in Geneva from 10 to 17 August 1949.

After the second session of the Expert Committee on Malaria of the WHO Interim Commission, the First World Health Assembly passed a resolution [2] instructing the Executive Board to establish an Expert Committee on Malaria to act as an advisory body to WHO. The Executive Board [3] at its first session decided that, during the period between the termination of the Interim Commission and the establishment of the new expert committee created by the First World Health Assembly, the Expert Committee on Malaria of the Interim Commission and the three members co-opted for the second session should continue to act as an ad hoc committee.[4] Under this provision, the committee gave advice :

(1) on details of field programmes of WHO, on the emergency field malaria programme of UNICEF in the Far East,[5] and

(2) on the draft resolution on legislation covering malaria control presented by the delegation of the Ukrainian SSR to the First World Health Assembly.[6]

---

[1] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

(1) NOTES the report of the Expert Committee on Malaria on its third session ; and

(2) AUTHORIZES its publication ;

Taking into account the recommendations of the expert committee in considering relevant items on its agenda,

(3) TRANSMITS the report to the Third World Health Assembly ; and

(4) POINTS OUT that recommendations of expert committees which concern WHO policy and operations remain recommendations unless and until they are implemented by the Executive Board or the World Health Assembly in adopting and putting into action the annual programme of WHO.

[2] *Off. Rec. World Hlth Org.* **13**, 300

[3] *Off. Rec. World Hlth Org.* **14**, 11

[4] Colonel M. K. Afridi, Dr M. Ciuca, Major-General Sir Gordon Covell, Dr N. H. Fairley, Dr J. W. Field, Dr A. Gabaldón, Dr P. F. Russell, Médecin-Général Inspecteur M. A. Vaucel, Dr D. K. Viswanathan, and Dr D. B. Wilson.

[5] *Off. Rec. World Hlth Org.* **14**, 11

[6] *Off. Rec. World Hlth Org.* **13**, 306

No meeting of the ad hoc committee was held but its members were circularized by mail.

The Joint Committee on Health Policy, UNICEF/WHO, in the report on its second session,[7] noted the guiding principles presented by the ad hoc committee in reference to the malaria problem in the Far East and requested the Director-General of WHO and the Executive Director of UNICEF to take action to implement these recommendations. (See section 5.3.)

The Executive Board, at its third session, examined a synopsis of the opinions of the members of the ad hoc committee and, based on it, adopted a resolution [8] requesting the new committee to draft a set of recommendations to governments on malaria control to be submitted for its approval to the Executive Board. These recommendations are presented in section 5.6.

The committee notes with satisfaction that a number of corresponding experts have been appointed by the Director-General. (Annex 1)

The committee notes with pleasure that the Executive Board approved six of the seven points presented in the report on the second session.[9] The seventh, which was a recommendation on quarantine against reimportation of anophelines, was appropriately referred for consideration to the recently created Expert Committee on Insecticides and also to the Expert Committee on International Epidemiology and Quarantine. (See section 4.1.)

The committee held discussions with a representative of FAO to consider the joint action of FAO and WHO to increase world food-production and raise standards of health. Comments on these problems are presented in section 5.4.

1. MALARIA AND UNDERDEVELOPED AREAS

The Expert Committee on Malaria at its third session wishes to emphasize once more the points presented in section 2 of the report on its first session [10] and section 1 of the report on its second session [11] in which the need for international malaria control on a worldwide basis was stressed. While each year malaria in one area after another is retreating dramatically as a result of the effective use of such new insecticides as DDT, yet the disease still has high incidence in large areas, causing hundreds of millions

---

[7] *Off. Rec. World Hlth Org.* **22**, 43
[8] *Off. Rec. World Hlth Org.* **17**, 10
[9] *Off. Rec. World Hlth Org.* **14**, 10
[10] *Off. Rec. World Hlth Org.* **8**, 8
[11] *Off. Rec. World Hlth Org.* **11**, 43

of cases and millions of deaths. Malaria still holds back, or makes impossible, food production in underdeveloped areas ; it still interferes seriously with industrial and agricultural activities in many tropical and subtropical areas ; and it still takes a high toll of victims in infancy and early childhood.

The committee in the reports on its first and second sessions stressed the fact that, by virtue of insecticides developed since 1940, it is now possible to obtain a degree of malaria control, amounting in some cases to actual eradication, formerly unattainable. During the past year, numerous additional examples of the successful application of residual insecticides have abundantly confirmed this fact. But the great need for effective governmental antimalaria organizations and for overcoming the critical shortages of trained personnel remains almost unchanged.

Malaria is now highly vulnerable to planned attack, and the committee agrees that the ultimate aim of WHO should be to eliminate this disease as a public-health problem from the world.

2. MALARIA THERAPEUTICS

2.1 Modern Antimalarials

A considerable amount of new evidence has recently accumulated about many of the new drugs, but the committee feels that none of these agents satisfies the ideal conditions, namely : that it be a causal prophylactic against all species of human malaria parasites ; that it be a good therapeutic agent and, at the same time, be truly curative ; that it possess low toxicity ; and that it be readily available at moderate cost. In these circumstances, it is essential to point out that all the available antimalarial drugs have various limitations which must be kept in mind when considering the suitability of a chemotherapeutic agent.

Before proceeding to the discussion of individual drugs, the committee wishes to emphasize that, until such time as malaria eradication is actually accomplished, it will be necessary to provide treatment for large numbers of malaria cases, particularly in underdeveloped countries ; health officers should, therefore, have up-to-date knowledge of antimalarial drugs so as to give the people the benefit of the latest advances.

In considering the action of these drugs, it must be remembered that there are considerable differences in the reaction of different geographical strains of parasites to drug prophylaxis and therapy, and that the state of premunition of the host may greatly affect the action of antimalarials. The efficacy of individual drugs therefore varies greatly in different places and with the state of premunition of the subject.

It is realized that in mass chemotherapy the cost factor is of prime importance when selecting a drug, but it may frequently happen that, in arriving at a decision, the dosage per case is overlooked in computing cost. Bound up with the question of costs is the need for stimulating local or regional manufacture of antimalarials, and the committee feels that WHO should take active steps to initiate inquiries through relevant international economic agencies. Admittedly, local manufacture would be influenced by such factors as the availability of raw materials and the technical potential of the area ; but, in the light of present knowledge, it would be preferable to concentrate on the production of synthetics rather than on growing cinchona, which would use up acreage needed for other agricultural pursuits.

During the past year, a number of promising new drugs have been put forward, but the committee feels that most of these are still in the experimental stage, and it will therefore confine the discussion to drugs belonging to the following five groups :

1. Quinine
2. Mepacrine [12]
3. Chloroquine [13] and other 4-aminoquinolines
4. Proguanil [14]
5. Pamaquin [15] and other 8-aminoquinolines

2.1.1 *Quinine*

Even though some of the newer and more potent synthetic compounds are in many respects superior to quinine, the popular concept of the treatment of malaria is still firmly associated with the latter drug. This applies particularly to the treatment of malarial emergencies, where the parenteral injection of quinine is generally recommended, although there is evidence that certain synthetic drugs are equally effective.

The general belief that quinine is relatively non-toxic and can therefore be safely administered by non-medical personnel is not borne out by a recent series of controlled experiments where it was observed that quinine, in two cases, left a constriction of the visual field throughout the period of observation which, in one case, lasted 18 months.[16]

---

[12] Atebrine, atabrine, acriquine, chemiochin, chinacrin, crinodora, erion, haffkinine, italchina, metoquina, metoquine, quinacrine USP.

[13] Aralen, nivaquine B, resochin, tanakân, SN 7618, 3377 RP.

[14] Chlorguanide USP, chloriguane, drinupal, guanatol, paludrine, palusil, tirian, M 4888, 3359 RP.

[15] Plasmoquine, plasmochin, praequine, gamefar, quipenyl.

[16] Coatney, G. R., Cooper, W. C., Ruhe, D. S., Josephson, E. S., Young, M. D. & Burgess, R. W. (1948) *Amer. J. Hyg.* **47**, 120

A further disadvantage of quinine is its association with blackwater fever. A marked reduction in the incidence of this disease has been recorded following the substitution of mepacrine for quinine in the prophylaxis and treatment of falciparum malaria among British troops in West Africa.

As regards suppression with quinine, no evidence has appeared to justify the modification of the committee's previous opinion that " the newer drugs are so much more active that few health authorities would be prepared to consider the use of quinine for this purpose ".[17]

2.1.2 *Mepacrine*

The value of mepacrine (quinacrine) as an antimalarial was not universally appreciated until after the supply of quinine was cut off during the second World War. This necessity led to crucial experimentation which showed that mepacrine is extensively localized in the tissues and that the effectiveness of the drug is a function of its concentration in the plasma. These facts led to the adoption of the regime of large loading doses during he first day or first 2 days of therapy to obtain prompt action.

Owing to the slow release of mepacrine from the tissues, suppressive levels are maintained long after the last dose of the drug has been administered, which results in delaying relapses of vivax malaria for 5 to 7 weeks. In critically ill or vomiting patients, mepacrine can be given intramuscularly.

Mepacrine has no causal prophylactic action, but it has proved to be a highly effective suppressant, although certain strains of *Plasmodium falciparum* resistant to this drug have been demonstrated. In field practice it has carried thousands of individuals through highly malarious areas without overt attacks until after the cessation of the drug administration.

Mepacrine is usually well tolerated, although gastro-intestinal disturbances may occur, especially at the start of therapy. A small proportion of individuals may develop temporary mental symptoms and serious skin reactions. A minor disadvantage, yellow discoloration of the skin and eyes, is not a toxic manifestation.

The main advantages of mepacrine over quinine are that it can be readily manufactured in quantity, it is a more effective therapeutic and suppressive agent, and, because of its slow elimination from the body, leads to wider spacing of relapses in vivax (and probably quartan) malaria.

---

[17] *Off. Rec. World Hlth Org.* **11**, 52

2.1.3 *Chloroquine and related 4-aminoquinolines*

Chloroquine rapidly alleviates acute attacks of malaria, and generally results in the radical cure of falciparum infections. Like mepacrine, this drug becomes extensively localized in the tissues, so that plasma concentrations cannot be built up rapidly unless a loading dose is given during the first day of therapy. Owing to the longer time required for the concentration of the drug to fall below an effective level after the last dose, relapses are delayed even longer than after mepacrine. The relative curative value of the two drugs may be judged from the fact that 2-, 3- or 4-day administrations of chloroquine have given better results than 5 to 7 days of treatment with mepacrine, and treatment using only single doses of 0.5 g. of chloroquine [18] is surprisingly effective in individuals possessing some degree of tolerance to malaria.

Recent studies have shown the effectiveness of this drug when given parenterally ; evidence on its intravenous use is incomplete. As a suppressant its action is unsurpassed by any other drug against all strains of parasite hitherto tested. *P. vivax* has been shown to be completely suppressed when 0.5 g. of chloroquine was given once weekly for 6 months to one group of experimental subjects and for one year to another group. Field suppression studies show that in adults 0.5 g. given once weekly results in almost complete protection against the three common forms of human malaria. In a dosage of 0.25 g. it was also fully effective in, and well tolerated by, infants and children.

The main advantages of chloroquine over mepacrine are that it allows more effective short-course or even single-dose treatments, relapses after its use are more widely spaced, and suppression can be obtained by administering the drug once a week. It does not stain the skin and eyes, and it does not ordinarily produce undesirable side-effects, although mild pruritus and temporary blurring of vision have been reported.

Its disadvantages are that it has a smaller margin of safety than proguanil and is relatively expensive.

There are several other 4-aminoquinoline drugs closely related to chloroquine which possess similar antimalarial properties. Chief among these are sontochin,[19] oxychloroquine,[20] and SN 10,751.[21] All three are effective and relatively non-toxic but are not at present commercially available. From work with experimental malaria, however, none of

---

[18] Doses are given in terms of the salt diphosphate (0.5 of the salt = 0.3 of the base).

[19] SN 6911, sontoquine, santoquine, santochin, nivaquine, 3038 RP

[20] SN 8137.

[21] Camoquin, amodiaquin, miaquin, CAM-AQI

these appears superior to chloroquine. Data from field trials are not sufficient for final conclusions.

2.1.4 *Proguanil*

Early trials with this drug led to the belief that this was probably the ideal antimalarial. Further investigations have confirmed the unusual properties of this compound but, at the same time, have served to uncover certain of its limitations.

Proguanil exhibits a wide range between minimum effective dose and maximum tolerated dose, in which respect it is superior to all other known antimalarial drugs. For example, clinical cures of vivax malaria have been reported with dosages as low as 6 to 12 mg. (base) daily for 4 days, and 1.5 mg. (salt) per day was temporarily effective if continued for several days. On the other hand, 1,400 mg. of proguanil per day have been given for as long as 28 days without ill effects.

Proguanil exerts a causal prophylactic action against *P. falciparum*, a property not possessed by quinine, mepacrine, or the 4-aminoquinolines. It has a suppressive action against all species of human malaria, a weekly dosage of 0.3 g.[22] having been shown to afford a high degree of protection in a number of field trials in many parts of the world. In certain comparative tests, however, the interval between cessation of drug administration and the onset of overt malaria in vivax infections was less than that observed in a comparable group of individuals who had received chloroquine. In therapeutic dosage, proguanil prevents the completion of the sexual cycle of *P. falciparum* in the mosquito, though evidence as to its effect on sporogony when given in suppressive dosage is not yet available.

Although proguanil is therapeutically effective against all forms of malaria, it is generally conceded that its action is less rapid than that of quinine, mepacrine, or chloroquine, and it is therefore unsuitable for use in the treatment of malarial emergencies. Moreover, when given alone, it cannot be relied upon to effect radical cure of infections with certain strains of *P. falciparum*. Both these disadvantages can, however, be overcome by reinforcement with mepacrine hydrochloride in adequate dosage (0.6 to 0.9 g.) administered on the first day of treatment. It is probable that reinforcement with chloroquine would be equally effective. As is the case of chloroquine, a high percentage of clinical cures can be obtained among individuals possessing some degree of tolerance to malaria by a single-dose treatment. Recent investigations have, however, indicated

[22] Doses are given in terms of the monohydrochloride salt (the monohydrochloride contains 86.5% of paludrine base).

the existence of strains of malaria parasites which are resistant, or have acquired resistance, to the action of this drug.

2.1.5 *Pamaquin and related 8-aminoquinolines*

The committee wishes to stress the fact that the foregoing drugs are only alleviative or suppressive with regard to relapsing vivax malaria and lack the ability to bring about a radical cure of this infection.

The advantage of the 8-aminoquinolines is that, when given with quinine, and possibly other agents, radical cure of vivax malaria is obtained. This is a matter of great importance in the case of individuals who are not likely to be re-exposed to malaria infection. Other special attributes of this group of drugs are that they are capable of producing causal prophylaxis against all forms of malaria and are effective gametocides. In neither of these respects, however, are they of practical value, for they are effective causal prophylactics only if given in dosages which are too close to the toxic level for safety, and their gametocidal properties do not materially affect the transmission of malaria in a community except in rare instances.

Within the group the various compounds differ from one another mainly in the degree of toxicity, pamaquin being the most toxic, followed by pentaquine and isopentaquine in that order.

2.1.6 *Summary : treatment, cure, and suppression*

The present position regarding the available antimalarial drugs in relation to therapeutic and suppressive treatment may be stated as follows:[23]

(1) *Treatment of the clinical attack :* Quinine, mepacrine, chloroquine (and analagous 4-aminoquinolines), or proguanil, when given in adequate dosage, will nearly always terminate acute attacks of malaria. Choice and dosage of drug, therefore, depend upon such factors as rapidity of action, incidence of side-effects, length of treatment period, the nature of the relapse pattern in vivax infections, natural or acquired strain-resistance, the presence or absence of immunity among the population, and the cost and availability of the drug. Chloroquine and proguanil are superior in most of these respects and can, at present, be regarded as the drugs of choice for routine therapy ; but, as already stated, the latter is unsuitable for use in malarial emergencies.

(2) *Cure of vivax malaria :* In relapsing vivax malaria, concurrent treatment with quinine and an 8-aminoquinoline, such as pamaquin, pentaquine, or isopentaquine, offers the best chance of radical cure. Of these, pentaquine and isopentaquine afford greater margins of safety between

[23] See table of dosages in section 2.2.

effective and toxic dosage. The same results may be obtained by prolonged administration of weekly doses of chloroquine or proguanil (" suppressive cure ").

(3) *Suppression of malaria :* All the drugs here considered, with the exception of the 8-aminoquinolines, when given in properly spaced doses, will usually keep malaria latent under conditions of exposure in the field or following treatment of an overt attack. The incidence of break-through is, however, so frequent with quinine in the highest tolerable doses that it is the least effective agent. Of the remaining drugs, mepacrine has the smallest margin of safety, in that even minor irregularities in taking the drug are apt to be followed by an overt attack. Chloroquine and proguanil have so far proved effective suppressants in most countries and, for that reason, are the most convenient to use and have the greatest margin of safety.

2.2 Dosages Commonly Used

2.2.1 *Mepacrine hydrochloride*

In treatment of clinical attacks, there is variation in the amount of the loading dose commonly employed from a minimum of 0.6 g. to a maximum of 1.0 g. on the first day. Four schemes widely applied are summarized below :

	1st day	*2nd day*	*Succeeding days*	*Total*
Non-immunes . . .	1.0 g.	0.3 g.	0.3 g. × 5 days	2.8 g.
	0.9 g.	0.6 g.	0.3 g. × 5 days	3.0 g.
	0.6 g.	0.6 g.	0.3 g. × 5 days	2.7 g.
Partial immunes . . .	0.6 g.	0.3 g.	0.3 g. × 5 days	1.8 g.

These amounts are for adults and are administered in 3 or more daily doses.

There is general agreement that the optimal suppressive dosage for non-immune adults is 0.1 g. daily ; a preliminary build-up of 0.3 g. daily for 5 days has been recommended. For suppressive cure of falciparum infection, the daily dose of 0.1 g. should be continued for at least 3 weeks after the last exposure. With partially immune populations, particularly in areas of low endemicity, suppressive doses of 0.3 g. given once weekly, or 0.2 g. twice weekly, have given a high degree of suppression. With this dosage, however, the possibilities of suppressive cure of falciparum infection are unknown.

2.2.2 *Chloroquine diphosphate*

American experience indicates that the optimal adult dosage, in commercial tablet forms, is as follows :

	1st day	*Succeeding days*	*Total*
USA	1.0 g. (in 2 doses)	0.5 g. daily for 3 days	2.5 g.
Venezuela . .	1.5 g. (in 3 doses)	1.5 g. on second day only, in 3 doses	3.0 g.

In Indo-China, good results have been obtained with the following dosage (of nivaquine B) in partial immunes : either 0.3 g. daily for 5 days, or 0.6 g. on the first day, 0.5 g. on the second day, and 0.3 g. on the subsequent 3 days.

For suppression, 0.5 g. of chloroquine is the dosage advised ; it is given once weekly on the same day of the week.

2.2.3 *Proguanil monohydrochloride*

There is such wide difference in the effective range of dosage that the indications which follow must be regarded as provisional :

(*a*) For standard therapy, in adults : 0.3 g. daily for 5 to 10 days.

(*b*) For the treatment of falciparum malaria, with particular reference to African strains of parasites, 0.6 g. daily for 10 days reinforced by mepacrine or chloroquine on the first day of treatment only.

(*c*) For single-dose therapy, in adults : 0.3 g. in one dose, followed by a weekly suppressive dose of 0.1 g. to 0.3 g. on the same day of the week.

For suppressive treatment, doses of the order of 0.1 g. given once weekly have been shown to be insufficient in some parts of the world ; in Indo-China, doses of 0.1 g. given twice weekly are apparently highly efficient ; likewise, in Malaya, doses of 0.2 g. once weekly have given no more than an occasional break-through ; in Malaya, and in hyperendemic areas in India, 0.3 g. once a week has given full protection. In Africa, 0.1 g. daily has been found necessary.

2.2.4 *Pentaquine*

American experience suggests, for adults, a 14-day course of 0.06 g. of pentaquine base daily, given concurrently with 2.0 g. quinine sulphate. Higher dosages have been employed — up to 0.12 g. base with the same amount of quinine — in order to raise further the cure-rate, but at this

dosage there is a danger of abdominal pain and moderate haemoglobinuria. Hospital observation is necessary whenever the daily dose of base exceeds 0.03 g. (The monophosphate of pentaquine contains 75% of base.)

2.3 Field and Hospital Trials

The committee favours the view that WHO should concentrate on stimulating and co-ordinating field and hospital trials on antimalarials through existing institutions in different countries, rather than to undertake such trials under its own initiative. The committee feels that the results expected from the latter course would involve disproportionate expenditure of money and effort which could be not justified, keeping in view the budgetary limitations of WHO. The committee, however, considers that WHO should use its good offices to direct these inquiries along uniform lines, so that the results obtained from the different countries will, as far as possible, be comparable. For this purpose, it would be advisable to circulate to the different institutions, either directly or through the corresponding experts, certain basic principles listed below, for their approval.

The results of these investigations should be obtained direct from the co-operating institutes, through members of the committee or the corresponding experts, and tabulated in the Malaria Section of WHO. The committee does not favour the alternative procedure of collecting such information by circulating a tabulated proforma to responsible investigators and to co-operating institutes.

2.3.1 *Chemotherapeutic trials*

(1) Trials should be limited to microscopically diagnosed cases of malaria and results analysed according to species of parasite.

(2) Chemotherapeutic agents should be administered only by a competent and responsible member of the investigation staff.

(3) The number of cases treated should be sufficiently large to allow adequate appraisal.

(4) All available evidence should be given as regards history of previous attacks of malaria or exposure to infection.

(5) Trials of a new drug should be run against simultaneous tests with a known drug.

(6) The effectiveness of the test drug should be measured by the following criteria :

(*a*) subsidence of fever below 100° F. ; recorded in 12-hour periods after the first dose ;

(*b*) disappearance of parasitaemia ; recorded in days after the first dose ;

(*c*) interval between the end of treatment and reappearance of parasites and/or fever. (The follow-up should preferably extend over a period of one year and statement should be given as to whether the subject has been exposed to re-infection.)

(7) The epidemiological features of the area where the malaria cases under trial acquired the infection should be considered, with particular reference to :

(*a*) endemicity of malaria ;

(*b*) antimosquito measures in force, and with what success ;

(*c*) transmission season ;

(*d*) degree of severity of the malaria season in the investigation period as compared with previous years.

2.3.2 *Suppressive treatment trials*

(1) The chemotherapeutic agent must be administered only by a competent and responsible member of the investigation staff, who should maintain a register wherein the necessary entry is made against each individual by name *at the time the drug is administered.*

(2) The population under trial should be as stable as possible and sufficiently large to allow adequate appraisal.

(3) All suspected break-throughs should be confirmed by microscopic diagnosis. They should be treated with the same drug as that used for suppression.

(4) The area selected for trial should be highly endemic or hyperendemic.

(5) The trial of a new drug should preferably be run against simultaneous tests with a known drug in approximately equal groups of persons living in the same locality.

(6) The epidemiological features of the area should be recorded, with particular reference to :

(*a*) endemicity of malaria ;

(*b*) antimosquito measures in force, and with what success ;

(*c*) transmission season ;

(*d*) degree of severity of the malaria season in the investigation period as compared with previous years.

2.4 Pharmacopoea Internationalis

The committee recommends that the following antimalarial drugs be included in the *Pharmacopoea Internationalis* :

(*a*) Quinine sulphate

(*b*) Quinine hydrochloride

(*c*) Mepacrine hydrochloride

(*d*) Mepacrine methane sulphonate (atebrin musonate)

(*e*) Chloroquine diphosphate

(*f*) Proguanil hydrochloride

(*g*) Pamaquin naphthoate

(*h*) Pentaquine phosphate

(*i*) Isopentaquine mono-oxalate

The committee was able to consider the draft statements prepared by the Expert Committee on the Unification of Pharmacopoeias relating to Quinini Sulfas, Mepacrini Hydrochloridum, Chloroquini Diphosphas, and Proguanili Hydrochloridum, and notes that synonyms have been included only in the case of Quinini Sulfas. The committee suggests that synonyms be similarly included in the statements relating to other drugs.

3. USE OF INSECTICIDES

3.1 Recommendations of First Session of Expert Committee on Insecticides [24]

The Expert Committee on Malaria, at its second session in Washington, recommended that an expert subcommittee on insecticides be set up to specify international standards for insecticides and their formulations, to stimulate the development of standard spraying equipment on a regional basis, and to deal with all other questions relating to the proper use of insecticides.

In response to these recommendations an Expert Committee on Insecticides was set up. At its first session, this committee laid down specifications for DDT, but noted that the data then available were insufficient for the drafting of specifications for other insecticides. It suggested, however, that recourse might be had to biological assay, as developed for the gamma isomer of benzene hexachloride, for the determination of the content of active constituent of other insecticides.

---

[24] *World Hlth Org. techn. Rep. Ser.* 1950, **4**

As regards formulations of insecticides, the committee considered that these were so numerous that, even if all the technical data were available, it would probably be inadvisable to specify them individually. It confined its remarks therefore to points which should not be overlooked by intending purchasers.

Recommendations were made as to the packing and marking of packages and for labelling insecticides or insecticide formulations in such a way as to specify the contents of these products in active ingredients.

Specifications were also laid down for compression- and hand-sprayers. No mention was made, however, of stirrup pumps (which have been found the most economical type of sprayers by many workers in countries where labour is comparatively cheap) nor to compressors for supplying air to knapsack sprayers which have been recommended by some workers as a time-saving device where a truck is used.

The Expert Committee on Malaria wishes to express its appreciation of the work of the Expert Committee on Insecticides in clarifying the points referred to it by the present committee.

3.2 Action of Economic and Social Council on the Production and Distribution of Insecticides

The Expert Committee on Malaria, at its second session, had recommended that the questions of regional production of residual insecticides, solvents, and wetting and emulsifying agents and of the waiving of customs duties on these insecticides in non-manufacturing countries be referred to the Economic and Social Council of the United Nations. In response to this request, a report [25] has been prepared by the Secretary-General. This report summarizes all available data regarding the production and prices of insecticides (DDT, benzene hexachloride, toxaphene, parathion, and pyrethrum) in different countries. Sections on world requirements and on trade barriers are also included. The committee expresses its deep appreciation of the great volume of information contained in this report. It wishes, however, to make the following observations :

(1) In the introductory section it is stated that, from the point of view of effectiveness, 1 lb. (0.45 kg.) technical DDT is roughly equivalent to 2 lb. technical benzene hexachloride, basic 12% gamma content. There appear to be insufficient data to substantiate this statement.

(2) The estimated world requirements are based on the supposition that 300,000,000 persons suffer from malaria each year. This does not

---

[25] United Nations Economic and Social Council (1949) *Availability of DDT insecticides for combatting malaria in agricultural areas* (Document E/1353).

appear to be a valid basis for calculating the world requirements of insecticides, since these must be applied to all houses in the locality to be protected and not only to those in which a case of malaria occurs. The only valid method of calculating the requirements must be one based not on the number of malaria cases, but on the size of population to be protected.

After considering the Secretary-General's report, the Economic and Social Council passed a resolution [26] recommending that Member Governments facilitate the freer flow, into countries where they are needed, of insecticides, raw materials, and equipment for their production by measures which they deem appropriate with regard to tariffs and import and export restrictions ; it further recommended that technical assistance be extended by the United Nations, its specialized agencies, and Member Governments to encourage the production of basic forms of insecticides in those underdeveloped countries in which the necessary preconditions exist for the economical development of such production, as well as the setting-up of formulating plants and the improvement of methods of application.

The Council also called to the attention of Member Governments the recommendations of the World Health Organization regarding the correct labelling of insecticides and requested the Secretary-General to continue his study of the subject and to present a further report to a future session of the Council.

The Expert Committee on Malaria expresses its satisfaction with the resolution adopted by the Economic and Social Council on 14 July 1949, the implementation of which will help to extend malaria control in many areas.

3.3 Limitations of Malaria Control by Residual Spraying

During the period which has elapsed since the last session of the Expert Committee on Malaria, the importance of the application of residual insecticides as a major method of malaria control has become even more evident. There are certain conditions under which the probable efficacy of this method might be doubted, as for instance where the persons to be protected sleep habitually outdoors, where the mosquito vector habitually bites outdoors or, though biting indoors, does not rest indoors, or where the surfaces sprayed are subject to frequent renovation or whitewashing. Experience has shown, however, that even when local conditions appear

---

[26] See resolution 225 (IX), 14 July 1949, of the Economic and Social Council of the United Nations. *Economic and Social Council. Official Records : Fourth Year, Ninth Session. Supplement No. 1. Resolutions*, page 19.

to be unfavourable, the application of residual spray may be attended with conspicuous success. The committee would therefore urge that the method be given a preliminary trial in all antimalaria campaigns however unfavourable the local conditions appear to be.

In places where a particular residual spray has proved disappointing because of its ineffectiveness against domestic flies, it may be found necessary to substitute some other insecticide for it or to use a second insecticide in combination with the first. For instance, in Italy, chlordane has been used in combination with DDT for this purpose. In Venezuela, BHC has been used in combination with DDT not only against domestic flies, but also for the destruction of *Triatomidae* (the transmitting agent of Chagas' disease), which are resistant to the effect of DDT when used alone.

3.4 Hazards to Man of DDT

It has been recently suggested that the widespread occurrence in the USA of a symptom complex of which gastro-enteritis is a prominent feature is a result of the indiscriminate and careless application of DDT by the householder. It has been suggested also that similar symptoms which have been reported in animals in that country are attributable to the same cause.

As was pointed out by the Expert Committee on Insecticides in the report on its first session, there is a very large body of evidence emphasizing the harmlessness to man and animals of DDT as commonly applied for residual spraying.

The committee, however, taking into consideration the fact that DDT is undoubtedly poisonous, although experimental evidence as to its toxicity to man is lacking, is of the opinion that the precautions usually advised on applying DDT should be strictly observed. Its routine application in antimalaria campaigns should be confined to personnel specially trained in the technique of spraying and familiar with the necessary precautions. Labels on all containers of DDT formulations sold to the public should indicate the procedure to be observed by householders in order to minimize the risk of injurious effects.

The committee notes the statement in the report of the Expert Committee on Insecticides that further experimental work on the subject is now in progress and that consideration of reports on this work will be placed on the agenda of the next session of that committee and emphasizes the need for this information.

4. ORGANIZATION AND PLANNING

4.1 Prevention of Importation of Anopheles

The Expert Committee on Malaria considered section 7 of the report on the first session of the Expert Committee on Insecticides and agreed with the measures proposed for preventing the introduction of anophelines into areas which are free or freed from them. In particular, the committee is of the opinion that the measures of disinsection at present applicable to aircraft may profitably be extended to sea and land traffic which comes from places which are not yet free from possible malaria vectors.

Having regard to the serious consequences entailed by undue interference with the movements of ocean-going vessels,[27] the committee considers that before regulations are formulated for the treatment of ships of heavy tonnage, further investigations are required : (i) as to the relative risks of importation by large and small ships ; (ii) as to the situation in such ships where anophelines are likely to be found ; and (iii) as to the best method of disinsecting such ships and the length of time which would be consumed in carrying this out.

The committee wishes to reaffirm the opinion put forward at its second session that whatever regulations be enforced regarding the disinsection of ships or aircraft, rigid antimosquito sanitation, including the elimination or treatment of potential breeding places, should be maintained within mosquito flight-range of sea- and airports of the country to be protected, so that no imported mosquitos will be able to survive. The committee considers this measure to be the most important safeguard available against the introduction of vector species of anopheles by sea- or aircraft.

4.2 Comparative Merits of Residual Spraying and Species Eradication

The assessment of the relative merits of malaria control by using residual insecticides on the one hand, and vector-species eradication on the other, requires the study not only of the merits and disadvantages of each method, but also of the conditions which render these methods possible.

While fully realizing the considerable advantages obtained by eradication of anopheline species in certain areas, the committee considers that the attention of administrators should be drawn to the fact that, once success has been attained, prevention of importation of anophelines still remains

---

[27] Section 6 of the report on the first session of the Expert Committee on Insecticides ; *World Hlth Org. techn. Rep. Ser.* 1950, **4**

essential and continued use of residual insecticides may be demanded for the control of other noxious insects.

For success in an eradication project there are a number of preliminary requirements, for it is necessary to have detailed information on the following points :

(*a*) the bionomics of the larvae and adults of the vector species ;

(*b*) presence or absence of natural barriers, to impede the reintroduction of the species eliminated, if the final objective of eradication is to be realized ;

(*c*) local topography, for the breeding places of the vector or vectors should be accessible, since eradication depends chiefly on antilarval treatment ;

(*d*) local administrative conditions, for eradication has its own strategy requiring a detailed organization with qualified personnel ;

(*e*) economic possibilities, for the cost of such a campaign is high and may be the determining factor in the choice of the method.

It is evident that the foregoing requirements may present difficulties in the eradication scheme, for example, if the treatment of the breeding places requires elaborate measures like clearing and drainage. Another handicap to eradication is to be found in the preliminary planning necessary, which makes it impossible to put this method into operation at short notice.

Malaria control by residual insecticides has the advantage of being an extremely simple and direct method of ending malaria by interruption of transmission ; it is not necessary to carry out the work throughout the entire territory, but only in houses and shelters in malarious zones. Another important advantage is that the campaign against mosquitos may be expected to destroy certain other house-haunting insects which may carry other diseases. From a technical aspect, this method does not require preliminary study of the biology of larvae of vector species such as is necessary in the case of eradication schemes, but the committee is of the opinion that adequate knowledge of the biology of the adults of the vector species is most desirable. This method does not require the geographical and topographical knowledge which is essential for an eradication campaign. From the administrative point of view, although it is preferable that the campaign should be organized on a countrywide scale, it can nevertheless give very good results even when greatly decentralized. Lastly, from the economic aspect, it is a solution within the means of most malarious countries, even in rural areas.

An apparent drawback of the house-spraying programme is that once used it has to be continued. Nevertheless, the permanent use of domestic

residual insecticides will not necessarily be confined to the prevention of malaria but may be directed also to the control of other noxious house-haunting arthropods, some of them vectors of disease. This means that trained personnel for house disinsection will always be at hand in case antimosquito spraying be again required. The expenses incurred in maintaining this service should not strictly be regarded as part of the antimalarial budget. It is possible that many governments may be unwilling to maintain an extensive organization for this purpose once the disease has ceased to be an important health problem.

Control by the residual method may effect very rapid results and may break an epidemic in full development, or even prevent its occurrence.

It is difficult to apply this method in countries where the raising of silkworms is widely undertaken, on account of its danger to the stages cultured in the houses.

The committee recommends that the merits and drawbacks of these two methods of attack on the malaria problem should be seriously considered by each country before undertaking an extensive antimalarial programme. It believes that, from every aspect, neither the eradication of a vector or vectors from an extensive malarious region, nor a widescale application of residual insecticides, should be undertaken without a preliminary trial on a limited area of the country, in order to estimate the chances of success and the cost of a project covering the whole country.

4.3 Larval Control

The committee is of the opinion that the addition of larval control methods would represent a very costly and quite superfluous effort in rural areas where control by residual insecticides is efficient against vector species. It is only in concentrations of population and urban zones that larval control might replace adult mosquito control, because the former is usually more economic in such situations, as pointed out by the committee in the report on its second session.

The committee is fully aware of the fact that, in certain countries, groups of the population leave villages that have been treated by insecticides during the height of the malaria season to spend many weeks in the fields in temporary shelters, or even without any shelters at all. There are obvious difficulties in the protection of these groups by the use of residual insecticides, but these may perhaps be overcome, as for instance by the erection and residual treatment of small artificial mosquito shelters with animal baits, or by the use of nets or covers treated with residual insecticides. Antilarval methods aiming at protecting these small migrant groups would be extremely difficult and costly, and the committee thinks that

the necessary funds for such an action might be put to better use in extending adult mosquito control. Furthermore, it might be possible to protect these groups under certain conditions by suppressive treatment. From the point of view of the country's health administration, these groups normally present only a limited problem which in the long run will probably cease to exist as the parasite reservoir disappears from the whole country.

4.4 Community Collaboration in Residual Spraying Campaigns

The committee is of the opinion that the collaboration of local populations in residual spraying campaigns should be fostered and can be given in the following ways :

(*a*) Supply of manpower at the expense of the community to make up spraying teams, under adequate supervision ;

(*b*) Use of residual insecticides by the population itself, under the leadership of the local administration and according to the directives given by the health authority, when endemic conditions do not make this undesirable, and when the educational level of the inhabitants permits it. The committee does not, however, consider that any reliance whatever can be placed on the initiative or action of private individuals to undertake residual spraying as a part of an antimalaria campaign.

4.5 Project of Species Eradication in Central Africa

The committee, having taken due account of the discussions which took place at the Second World Health Assembly, and recognizing the difficulties which are inherent in any eradication scheme, still considers that the scheme should be provided for because the problem of eliminating or reducing malaria in tropical Africa has not yet been solved ; and, as it affects a considerable human population, it deserves the full attention of WHO.

The committee is of the opinion, however, that a final decision on the project cannot be taken until after the conference in tropical Africa which the Second World Health Assembly sanctioned for 1950 has completed its deliberations. It had before it evidence on the technical form which such a scheme might take, but in view of the foregoing recommendation it considers that it would be premature to prepare such a scheme at the present time.

The committee wishes to emphasize the urgency of the malaria problem in Africa and would strongly recommend that the convening of the proposed conference be given a very high priority. The committee also hopes that its own next meeting will be held at approximately the same time and

at the same place as this conference in order that there may be no delay in formulating detailed recommendations on this subject and others allied to it.

4.6 Standardization of Procedure in Epidemiological Inquiries on Malaria

The committee is of the opinion that it is desirable to carry on the attempts made by the Malaria Commission of the League of Nations to standardize the methods used in malaria epidemiological inquiries.

This standardization seems to be particularly necessary for the objective assessment of the results of malaria control campaigns and comparison of these results in various countries.

The committee, not able to define now the standards it should like to adopt, asked its chairman to appoint a drafting committee which should study the question, in consultation with other members and corresponding experts, and submit a report to the next session.

5. WHO MALARIA ACTIVITIES AND PERSPECTIVES

5.1 Objectives

The committee is in general agreement with the basic objectives, both long- and short-term, expressed in the statement of proposed programme for the year 1950, submitted by the Director-General of the World Health Organization and adopted by the Second World Health Assembly.[28] In other words, it appears to the committee that the function of WHO as regards malaria should be to stimulate and to assist governments which have a malaria problem to apply actively those modern methods of control which have now been shown to be so highly effective and economical. The ultimate aim may, perhaps, be the eradication of malaria from the world, as stated in the document mentioned above. But this can be achieved only after each and every government faced with malaria has put into effective operation an adequately financed antimalaria organization adapted to local conditions and needs and properly staffed with well-trained personnel. In numerous countries antimalaria programmes are well advanced, and in some cases it is reasonable to predict the eradication of malaria within the next decade. But in a majority of malarious areas, there is still great need for practical encouragement and help along the lines of the proposed programme discussed in this report.

The committee recalls that at its first session it recommended that provision be made for the whole committee or its members individually to

---

[28] *Off. Rec. World Hlth Org.* **18**, 58 ; **21**, 189

visit malarious areas to advise local governments on request or to obtain a clearer understanding of local problems, or to obtain new and useful information. The committee would emphasize again the willingness of its members, within the limitations of primary responsibilities, to go into the field specially to assist WHO in evaluating WHO co-operative projects either before, during, or after the period of the project.

The committee also emphasizes its willingness to be circularized by mail, individually or collectively, regarding pertinent malaria questions arising from time to time. Finally, the committee would welcome periodical summaries of WHO malaria projects in operation. The committee believes that it cannot be of the greatest help to WHO unless it is well informed of the malaria activities of the Organization.

5.2 Decisions of the Second World Health Assembly

Two sets of resolutions concerning malaria were adopted by the Second World Health Assembly. One was devoted to the immediate programme for 1950 and others to general antimalaria policy.

The committee notes with satisfaction that, in the first resolution referred to, the Assembly adopted the programme presented by the Executive Board for the financial year 1950. It regrets the reduction in the budget, from $439,255 to $374,655, but realizes that this was made necessary by limitation of funds.

The committee expresses its satisfaction with the resolutions of the Assembly concerning joint activities with the Economic and Social Council, with FAO, and with UNICEF,[29] for they will help in enlarging to an appreciable degree the antimalarial activities which WHO can undertake.

5.3 Malaria and Child Welfare : Co-operation with UNICEF

The Executive Board of the United Nations International Children's Emergency Fund (UNICEF) allocated in 1947 and 1948 a considerable sum for work in countries of the Far East, other than China, and it appointed a survey mission. The committee has read with interest the report of this mission.[30]

The committee notes with satisfaction that the Executive Board of UNICEF passed a resolution allocating $300,000 for malaria control in those countries, and that the Joint Committee on Health Policy, UNICEF/

---

[29] *Off. Rec. World Hlth Org.* **21**, 24, 29

[30] UNICEF document E/ICEF/72

WHO, passed a resolution at its first session [31] deciding that such allocation should be placed before competent WHO experts for their advice as to how it could best be utilized for the benefit of pregnant women and of children up to the age of 18. In the same resolution it was also decided that the suggestions on malaria control presented by the mission mentioned above be placed before the same experts.

The Committee reiterates the suggestions made by the ad hoc Expert Committee on Malaria [32] as follows :

(*a*) that any assistance for malaria control, given to governments, should have in view a long-term policy ;

(*b*) that the assistance offered should be for at least two years ;

(*c*) that it should be given to governments in possession of a permanent and properly staffed antimalaria organization or willing to establish one ;

(*d*) that any action against malaria should be carried out in conjunction with such an organization ;

(*e*) that funds should be devoted to training of personnel ; and

(*f*) that the most profitable form of assistance is probably the lending of demonstration teams to carry out malaria control by residual insecticides.

The committee therefore expresses its satisfaction that the Joint Committee on Health Policy, UNICEF/WHO, at its second session [33] adopted these principles with the following recommendations :

(*a*) that they be followed as far as possible by the Chief of Mission for the Far East in reference to malaria-control demonstrations ;

(*b*) that the services of a competent malariologist be made available to the Chief of Mission for the Far East ;

(*c*) that so far as possible all UNICEF/WHO malaria-control projects in any one area be amalgamated ; and

(*d*) that the requests submitted by the different governments be dealt with in the light of the guiding principles outlined above.

The committee believes that this UNICEF/WHO co-operative project may be of great help to the countries concerned because it has enabled the establishment of malaria demonstration teams at a rate far greater than otherwise would have been possible. Furthermore, the committee sees it as an example of how WHO may co-operate with and technically help other specialized agencies in antimalaria programmes.

---

[31] *Off. Rec. World Hlth Org.* **22**, 40

[32] Unpublished working document JC2/UNICEF-WHO/2

[33] *Off. Rec. World Hlth Org.* **22**, 43

The committee emphasizes that the following points should be taken into consideration in planning combined UNICEF/WHO projects :

(*a*) The procedure for the selection of areas for such projects should be worked out in detail, following the lines indicated in section 5.5.4 ;

(*b*) Demonstration teams should reach the areas selected preferably soon after the end of the malaria season, so that they may have ample time to complete their preparations for next year's work ;

(*c*) Orders for supplies and equipment should be placed in ample time so that the commencement of the team's activities may not be delayed ;

(*d*) The sending of demonstration teams is the best form of assistance available for countries not already possessing a malaria service.

5.4 Malaria and Agriculture : Co-operation with FAO

One section of the report on the second session of the committee was devoted to the subject of agriculture and malaria. The committee recommended that WHO and the Food and Agriculture Organization (FAO) should collaborate in selecting areas suitable for joint projects in which relatively large-scale efforts would be made to increase food production by general improvement of health, welfare, and agricultural methods, with particular emphasis on malaria control. This subject was again on the agenda of the committee at its present session, and FAO was represented during the discussion. The representative of FAO made it clear that his organization is greatly interested in the proposals and is prepared to collaborate in the preliminary selection of possible areas. Then, if funds permit, FAO is prepared to join with WHO in the formation of survey parties to make the final choice of areas and eventually to proceed with actual experiments if feasible. The representative of FAO hoped that the committee could indicate certain areas which it now believes might be suitable from the standpoint of malaria. In general, FAO considers that priority of consideration might be given to areas within Latin America, the Middle East, and Asia.

The committee again agrees that this subject has great importance and it would like its implementation expedited. The committee would like to suggest a certain definite procedure which might be followed in selecting the experimental areas. The logical steps are (1) preparation of a preliminary list of possible areas, (2) screening this list, (3) selection of not more than three areas of a size compatible with the objectives.

The committee believes that in drawing up a preliminary list of possible areas both FAO and WHO might submit suggestions, the respective secretariats putting the lists together for submission by correspondence to the Expert Committee on Malaria of WHO and to the appropriate

body of FAO for comment and screening. As regards the preparation of the WHO list of suggested areas, the committee believes that in the near future governments might be canvassed through WHO regional offices and requested to name areas in which they would be willing to co-operate with joint WHO/FAO survey parties and with actual experiments if an area were found suitable. The committee suggests that it might be desirable to have its own members and the corresponding experts requested by mail as soon as possible to specify in detail any areas which they think might be mentioned by regional offices to governments as possible areas of collaboration.

When WHO has received the regional lists, these might be combined and communicated to the FAO Secretariat which in turn might make known its own list to WHO. The joint list could then be screened by appropriate committees or bodies of the two organizations.

The committee suggests that, when the joint list has been thus screened, the secretariats of the two organizations will select four or five of the seemingly most suitable areas, form joint survey parties, and, on the basis of survey reports, select not more than three areas for the actual demonstrations.

The committee believes that due consideration might well be given to those areas of potential agricultural productivity recently malarious but now freed of this disease by governments. In such areas, it should be noted, there would be great economy of funds and time for WHO because much of the preliminary disease-control work would have already been accomplished. WHO could therefore concentrate its efforts on the most important health problems remaining and thus bring an area to a still higher level of potential productivity.

The committee suggests that consideration should be given to areas suitable for the resettlement of populations or where such a programme is already in operation.

The committee also agrees with FAO that priority of consideration at this time may well be given areas which fall within the Eastern Mediterranean, South-East Asia, Western Pacific, and American regions.

5.5 Methods

5.5.1 *Governmental organizations*

The Expert Committee on Malaria in the report on its second session stressed the fact that effective control of malaria in any country is possible only when and where there has been set up a governmental malaria-control organization of appropriate size, the personnel of which is suitably paid and adequately trained.

Although the primary object will be to attain malaria control as rapidly and economically as feasible, yet, naturally, the type of organization will vary greatly according to local conditions. Examples of such organizations were given in the report referred to above. In the reports on both its first and second sessions, the committee recommended that WHO be prepared, through its regional offices, to assist governments in establishing or improving such organizations. As noted in the first report, it sometimes requires the sort of initiative, technical advice, and assistance which WHO can give to start a malaria-control programme and to bring it to a point where a government can carry it forward.

The committee therefore notes with satisfaction that WHO in 1949 has implemented this recommendation and proposes in 1950 to extend the scope of this type of aid to governments.[34]

The committee suggests that whenever WHO malaria-control demonstration assistance is extended to a country in which a suitable malaria-control organization does not exist, this assistance be conditioned by the willingness of the country in question to set up such an organization, or reorganization, as soon as feasible. The committee further suggests that in such cases WHO offer the assistance not only of the control demonstration team but also of a short-term expert consultant qualified to advise on malaria-control organizations.

5.5.2 *Training of governmental personnel*

The opinion of the committee has again been requested in reference to the training of antimalaria personnel. What follows merely amplifies statements presented in the report on the second session of the committee.

The committee realizes that in various countries antimalaria organization is in different stages of development. In some areas special attention should still be paid to the training of antimalaria personnel. This personnel was classified in the second report of the committee as follows :

(*a*) directive professional staff

(*b*) assistant professional staff

(*c*) subordinate personnel

The directive professional staff in a country which does not have an antimalaria service may require a more intensive and general training than in countries where such an organization is already in existence. It must be realized that countries in the former category are primarily in need of an officer capable of fulfilling the function of director of the national malaria service when established.

---

[34] *Off. Rec. World Hlth Org.* **18**, 58

WHO demonstration teams in countries without efficient malaria services or entirely lacking them may be able to assist the governments to select from available trained health officers or local doctors the men who, after further training in malariology, might be qualified to hold key positions in the antimalaria organization. This assistance in selecting candidates in some countries should be one of the most important activities of the demonstration teams ; otherwise, when they leave the country, the work started and the standards reached by them will not be maintained. The committee recommended in the report on its second session that plans should be made for the demonstration teams to remain in an area for at least two years in countries where malaria control is non-existent or seriously inadequate so that they might have time enough to supervise the adequate training of the directive personnel staff who will be responsible for carrying out the work after the team leaves. Complete failure of the work done by the demonstration team may result if it does not leave behind in the country assisted a well-trained and responsible directive professional staff.

Qualified directive professional staff are particularly required for national or regional work within a country. This personnel should be recruited preferably from among men trained in public health, as well as in malariology. Such combined training commonly requires two years to obtain the desirable theoretical and practical education in these fields. It is generally unwise to attempt economy in the establishment of such staff, as without the best available personnel the antimalaria work will not develop in the proper way. In the past some malariologists have been simply epidemiologists and entomologists with no special interest in the control of malaria. Broader training of malariologists is important because, when working in directive positions, they are responsible for the administration of the programme, and thus will be in contact with officers in the health department having such training. It is therefore advisable that both groups be on an equal footing as regards general health training.

The committee believes that courses in malariology should be comprehensive and should cover the whole field of this branch of science. At the same time it is advisable that in such courses some time be devoted to the study of other metaxenous [35] diseases susceptible to insecticidal control. Malariologists may be called upon to undertake control of some of these diseases. This evolution is desirable because, if governments lose interest as malaria is reduced, the malaria service will deteriorate and may not be able to cope with a malaria outbreak which might occur. It seems

---

[35] Metaxeny — change of host. Metaxenous diseases — " These are diseases due to parasites which are common to two (or more) species of animals." " Metaxenous parasites are those which spend part of their life in one kind of animal and the rest of it in another." (Ross, R. (1911) *The prevention of malaria*, 2nd ed., London, pp. 665 and 11-12.)

advisable, on the other hand, to continue the intensive training in malaria from a methodological standpoint, as it will show the technique of appropriate study and control of metaxenous disease. Furthermore, the existing courses in malariology have already developed teaching materials which may continue to be used with profit.

The experience obtained at the Malaria Institute of India and in the school of the Division of Malariology of the Ministry of Health and Social Welfare of Venezuela in the courses given for several years shows that such courses should preferably extend over a period of 3 to 5 months. The committee believes that fostering of this training could best be developed on a regional basis along the lines of assistance which were suggested in the report on its second session.

The assistant professional staff will be mainly in charge of laboratory and field work, and their training may be given in each country by the directive professional staff. For some countries this training may be carried out in a most efficient way by establishing within the antimalaria service adequate centres for instruction, with appropriate facilities, to function as schools not only for the assistant professional staff but also for subordinate personnel. This training should be implemented as indicated in the report on the second session of the committee. Of this personnel, however, the entomologists should have had or should receive thorough training in the field of biology and related subjects, training which may not be obtainable in their own country.

With reference to subordinate personnel, appropriate indications were presented in the report on the second session, as were other steps which should be taken to keep the staff up to date in malariology.

5.5.3 *Expert consultants*

The committee notes with satisfaction that there are provisions in the 1950 programme for sending out on request both full-time and short-term malaria consultants. The committee emphasizes again its belief that properly qualified WHO expert consultants may be of great help to governments in such ways as : planning a new malaria organization or improving an existing one ; planning the details of a malaria-control project ; planning a malaria school or malaria courses ; lecturing at malaria schools or in courses ; evaluating WHO co-operative projects before they have been approved, while they are in operation, or after they have terminated.

5.5.4 *Malaria control teams*

In the report on its second session, the committee outlined in a general way the importance, composition, and type of work which operational

demonstration teams could carry out. The committee believes that the sending of these teams is one of the most efficient ways in which WHO may foster antimalaria work throughout the world. At the same time the committee realizes that with the increased demand for antimalaria operations in many regions there is a lack at the present time of competent trained personnel to constitute such teams. Therefore, the committee recommends that WHO consider the possibility of providing the training of selected candidates for specific positions on field projects when no suitably trained personnel is otherwise available. The personnel of such projects should be of the highest class in order that they may effectively influence the development or improvement of malaria control in a country. Great care therefore should be taken in the selection of this personnel.

The committee believes that special consideration in each region should be given to countries without, or with inadequate, antimalaria services. There is the possibility that some countries may not submit a request for a team to WHO because they may not have known of their existence. The committee believes that WHO regional offices should take steps to encourage such requests. These countries should have priority in the sending of teams over others which already have well-developed antimalaria services. The committee feels that the operational demonstration teams should not be units to foster antimalaria operations in quantity but in quality. The committee is happy to know that already seven of these teams are at work, which is four more than was envisaged at its second session. This number has been possible because of the co-operative programme with UNICEF mentioned above in section 5.3.

The committee feels that the countries to which these teams may be sent should be willing to organize or reorganize an antimalaria service. As previously noted, the committee insists that the main antimalaria objective of WHO should be " to assist governments on request, through regional organizations, when established, in setting up on a permanent basis, malaria-control services suited to local needs, and that these services should be of adequate size, staffed by adequately paid and adequately trained personnel " (Recommendation 9.1.1 of the report on the second session). The committee calls attention again to the fact that the primary aim of the operational demonstration teams should be " to give adequate advice and practical assistance to governments in order to foster the development of local and national malaria-control programmes " (Recommendation 9.1.3 of the report on the second session). In view of these statements, the committee recommends that, while the operational demonstration teams must remain directly responsible to WHO, they should be instructed to fit themselves into the framework of the respective department of health or of the malaria service if such exists. It is the opinion of the committee that WHO should not foster any antimalaria action in a country with an

operational demonstration team whose work may not be easily absorbed and continued by the corresponding antimalaria service.

As the malaria problems vary so much from different points of view in the different countries, the committee emphasizes that the operational demonstration teams be organized with considerable elasticity and flexibility, from the standpoint of WHO or national personnel. This refers not only to the directive professional staff but also to the assistant professional staff and to subordinate skilled and unskilled personnel. A rigidity in the constitution of these teams may hamper the appropriate development of the malaria service of the country concerned.

The main object of these operational demonstration teams in field work should be to demonstrate the use of residual insecticide spraying as a method of malaria control. The results of this work should be primarily measured by the effects on malaria reduction, as control of this disease is the final goal of the whole enterprise. The field development of the work should be flexible, in order to be adapted to local conditions. Here again rigidity may cause partial failure in the results, or unnecessary waste of money. It is therefore important for the team leader to be well acquainted with residual insecticide spraying, from both the technical and administrative points of view. The committee notes with satisfaction that it is the policy of WHO to have team leaders visit some areas where that type of work is being effectively carried out.

The committee believes that WHO should not hesitate to carry out with such teams pilot experiments in areas where no previous residual spraying has been done, or where previous work leaves the matter of control by this method open to question. The committee believes that, even in malarious places where the vector species is still unknown, WHO should not hesitate to carry out pilot projects in residual spraying. In both instances careful observation should be carried out not only on the anopheline population, but more particularly on the incidence of malaria.

The final success of such teams will not be measured by the degree of malaria reduction they may obtain, but by the degree of effective antimalaria work that the respective country may continue to do after the team leaves.

5.5.5 *Education of the public*

New statements on this problem have been requested from the committee. The education of the public with reference to malaria is a subject which requires a specialized technique usually not available in an antimalaria service. The technique required by this work is common to that of public-health education and therefore should be carried out by the appropriate service of the country. It is believed that much money has been

wasted by malaria services trying to develop antimalaria propaganda without the advice of specially trained personnel.

The education of the public in malariology, and, as a matter of fact, in any other aspect of health, is a problem which varies from one country to another, and even within a country in different communities according to race, religion, language, and degree of education. These facts have been quite often forgotten in attempts to carry out antimalaria education of the public. In its antimalaria activities, WHO should call upon its own specialized services in public-health education for adequate help.

It may be said, however, that the education of the public in malaria control should be directed towards (*a*) children, and (*b*) adults. These two groups require different methods of education, and therefore two groups of activities should be developed to cover them.

Education of schoolchildren in malaria prophylaxis should be compulsory in those countries where malaria is prevalent. In many of the Latin American Republics, where hygiene is taught in primary schools, malaria receives considerable attention. The Division of Malariology of the Ministry of Health and Social Welfare of Venezuela, in order to foster antimalaria teaching in the primary schools, had for several years a teacher specially trained in malariology taking part in the vacation extension courses for teachers given every year by the Ministry of Education. He developed teaching units for every grade, and this proved to be very helpful to the teachers.

Education of adults in malaria control is a much more difficult task. It is surprising that malariologists, who spend their lives among indexes and rates, measuring different facts, have not used more often some standard for evaluating results achieved by antimalaria educational campaigns. Only one paper, published in Venezuela, on this subject is known to the members of the committee. It is believed that adequate surveys before and after educational campaigns should be carried out in ways similar to those used as controls in any pilot antimalaria project, and the committee highly commends this procedure.

Because of what has been said above on the different problems presented by different peoples, sometimes within a single country, it is believed that films may be the most expensive and least satisfactory method of accomplishing public antimalaria education. Films seem to appeal strongly to administrative authorities, and due care should be taken against unnecessary expense on this account. Films are, on the other hand, particularly suited for school antimalaria education, especially in secondary schools. Film strips and lantern slides are also recommended for school work.

Posters may be useful in adult antimalaria education. They provide the cheapest way to reach a large number of persons. But they should

fulfil all the technical requirements to be of real use. Before being put into circulation they should be thoroughly tested to ensure that they are going to be understood by the public to whom they are directed. Photographs and pictures are better in the hands of the regular public-health visitors, for public-health education within the home, and the committee is of the opinion that stress should be laid upon direct approach by health visitors, where available.

The committee wishes to repeat and to emphasize that by far the most effective propaganda is a successful demonstration of practical malaria control. The sudden and quite often spectacular reduction of malaria and, more often, of domestic insects after the application of residual insecticides such as DDT constitutes the best form of propaganda to obtain the co-operation and support of the competent authorities and of the general public. In many countries it has been observed that such success immediately brings requests to extend the campaign to neighbouring areas.

5.5.6 *Research*

The committee calls attention to the two recommendations regarding malaria research which were submitted in the report on its second session and notes that steps are being taken to implement them, following approval by the Executive Board (see sections 2.2 and 4.5).

The committee is not suggesting that any new malaria experiments be financed by WHO, but it wishes to emphasize that, in connexion with the demonstration control teams, full advantage should be taken of opportunities to study the action of new insecticides against malaria vectors heretofore not subjected to this form of control.

5.6 Recommendations to Governments [36]

As noted in the introduction to this report, the Executive Board has requested the committee to draft a set of recommendations which, on

---

[36] The Executive Board, at its fifth session, adopted the following resolution:

The Executive Board

(1) APPROVES the "Recommendations to Governments" detailed in subsection 5.6 of the report; and

(2) REQUESTS the Director-General to circulate them to all Member Governments of countries where malaria is a problem, at the same time calling the attention of such Member Governments to the other important recommendations of the committee, viz:

(*a*) that the relative merits and disadvantages of malaria control by residual spraying or by anopheline species eradication be given serious consideration before extensive antimalaria programmes are undertaken;

(*b*) that larval control in rural areas be abandoned where residual insecticides are extensively applied and found to be effective.

approval, might be submitted by the World Health Organization to governments. The committee recommends the following :

(1) WHO desires to stress the importance of malaria, which still attacks hundreds of millions of persons each year, causing millions of deaths. Malaria is a major source of mental apathy and general physical deterioration, and this is responsible for a serious loss of working efficiency wherever the disease is endemic. Malaria is a direct factor in the world shortage of food, and it causes grave interference with industrial and agricultural development and enterprise. WHO urges each government faced with a malaria problem to attack it as promptly and vigorously as possible.

(2) WHO also desires to emphasize that today, at financially feasible costs, governments can attain a degree of practical malaria control, and even malaria eradication, utterly impossible fifteen years ago.

(3) Further, WHO desires to make the following particular points about malaria control, based on deliberations of the Expert Committee on Malaria of the World Health Organization Interim Commission and of WHO at sessions held in 1947, 1948, and 1949, and on documents and resolutions of the First and Second World Health Assemblies in Geneva in 1948 and in Rome in 1949, respectively.

(i) The first essential for effective control of malaria in any country is the establishment on a permanent basis of a malaria-control organization of adequate size, staffed by adequately paid and adequately trained personnel.

(ii) In the existing state of knowledge, measures directed against the mosquito transmission of malaria are the only methods which give effective control. They should take priority, wherever possible.

(iii) The application of a modern insecticide such as DDT as a residual spray on the inside walls of habitations and other mosquito shelters to kill adult anopheline vectors is the most effective method of mass attack on malaria in rural areas so far evolved. The practical success of residual spraying already demonstrated in many parts of the world has advanced this method well beyond the experimental stage and it can now form a basis for extensive malaria-control programmes. However, it is essential that spraying operations be organized systematically, keeping in view such factors as natural history of the local vector-species, nature of sprayed surfaces, formulation and dosage of insecticide, frequency of spraying, and selection of suitable equipment.

(iv) Chemotherapy, specially with the newer antimalarial drugs, is essential in the clinical control of *epidemics* of malaria, but it is clear that chemotherapy plays a secondary role in the prevention of malaria. While therapeutic and prophylactic antimalarial drugs should be available to those who require them (regardless of ability to pay for

such treatment), it must be emphasized strongly that in numerous rural areas throughout the world the use of residual sprays has in two or three seasons made mass chemotherapy and mass chemoprophylaxis of malaria unnecessary and obsolete. On the contrary, intensive distribution of free antimalarial drugs for many years in other areas has had no noticeable marked influence on the incidence of malaria, except under well-supervised groups.

(v) Methods of irrigation, cultivation, and animal husbandry should be improved where necessary, so that they will tend to reduce rather than intensify malaria prevalence. In particular, new public works, including irrigation and road construction, should be carefully planned in consultation with the malariologist so that they will not become, as has frequently happened in the past, a source of malaria.

(vi) Sometimes much malaria can be averted in housing projects if they are so planned that malarious sites are avoided and malariogenic conditions are not created by construction operations.

(vii) Governments should actively support scientific research directed specially towards improving malaria control and therapy.

(viii) Legislative enactments are essential to give legal sanction and support to appropriate malaria-control measures within a country.

(ix) The prevention of the exportation and importation of living anophelines (as well as other arthropods) is in many countries a matter of great importance and requires the co-operation of all governments in carrying out suitable quarantine measures under national and international regulations. Further, it is urged that all countries confronted with the problem of malaria should take active measures to prevent the spread of anophelines within their own borders.

(x) While it is recognized that a reasonable amount of malaria survey work should precede control, yet it must be emphasized strongly that where malaria is known to be a problem it is important to start residual spraying, at least as a pilot experiment, as soon as possible and not delay for the purpose of extensive studies. Concurrent entomological and epidemiological investigations are essential for checking and for guidance. But case-finding and tracing of carriers, according to present experience, soon lose significance when active residual spraying is being carried out. Notification of malaria cases, of course, is still of importance to a public-health department.

(4) Finally, WHO calls attention to the fact that, within limitations of its budget and through its regional organizations, it is prepared to give on request certain types of malaria-control assistance to governments and help to institutes devoted to training in malariology. In particular, it will make available

(*a*) expert advice and technical reports on the control of malaria and on the education of the public in malaria prophylaxis ;

(*b*) fellowships and travel grants for malaria-control training ;

(*c*) teams and individual experts to carry out demonstration malaria-control programmes and to develop malaria-control organizations ;

(*d*) lecturers, literature, and teaching equipment to schools of malariology.

5.7 The Darling Foundation

As requested, the committee, in consultation with the Director-General and his legal advisers, submits to the Executive Board for approval a draft of the revised regulations of the Foundation for the award of the Darling Medal and Prize. These draft regulations are in Annex 2.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Malaria and Underdeveloped Areas

The committee stresses again the fact that in so many tropical and subtropical countries malaria constitutes the greatest obstacle to development and recommends that, in any WHO programme of technical assistance to malarious underdeveloped areas, malaria control be given the highest priority.

6.2 Malaria Therapy [37]

6.2.1 The committee wishes to emphasize once again that, in the communal control of malaria, interruption of transmission at the mosquito level is the method of choice. Until such effective control is accomplished, there will, however, be need for providing facilities for the treatment of a large number of malaria cases. The committee therefore urges that health officers should have up-to-date knowledge of antimalarial drugs so as to give the people the benefit of the latest advances.

---

[37] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

(1) APPROVES the recommendation concerning the co-ordination of research on malaria therapeutics ; and

(2) REQUESTS the Director-General to draw the attention of the Member Governments to the benefit that might be derived in achieving co-ordination of national institutes undertaking research of this nature, such co-ordination resting on the basic principles outlined by the committee in subsection 2.3 of the report.

In view of the continuous accretion of fresh evidence relating to antimalarial drugs, the committee is still reluctant to give firm recommendations for the use and dosage of the new compounds but has summarized the available information which may serve as a useful guide.[38]

6.2.2 The committee considers that WHO should stimulate and co-ordinate researches on malaria therapeutic and suppressive treatment through the existing institutions rather than undertake trials on its own initiative. Such inquiries should, as far as possible, be directed along uniform lines so that the results obtained from different countries would be comparable. For this purpose certain basic principles have been listed.[39]

6.2.3 The committee recommends that the following antimalarial drugs be included in the *Pharmacopoea Internationalis* :

(*a*) Quinine sulphate
(*b*) Quinine hydrochloride
(*c*) Mepacrine hydrochloride
(*d*) Mepacrine methane sulphonate (atebrin musonate)
(*e*) Chloroquine diphosphate
(*f*) Proguanil hydrochloride
(*g*) Pamaquin naphthoate
(*h*) Pentaquine phosphate
(*i*) Isopentaquine mono-oxalate

6.3 Insecticides

The committee notes with satisfaction the setting-up by WHO of the Expert Committee on Insecticides to specify international standards for insecticides and their formulations, to stimulate the development of standard spraying equipment on a regional basis, and to deal with all other questions relating to the proper use of insecticides.

In order further to stimulate the use and production of insecticides and to render them available to all malarious countries, the committee recommends :

6.3.1 that WHO continue to take steps to facilitate, through the existing international economic machinery, the obtaining of requests for antimalaria supplies by governments ;

---

[38] See sections 2.1 and 2.2.

[39] See section 2.3.

6.3.2 that WHO explore the possibility, in its co-operative programme with UNICEF, of aiding the production of basic forms of insecticides and/or their formulations in those non-manufacturing countries in which the necessary pre-conditions exist for the economical development of such production ; [40]

6.3.3 that WHO, with the advice of the Expert Committee on Insecticides, consider steps for circulating to governments the specifications of important insecticides and/or their formulations to be used when ordering supplies.[41]

6.4 Organization and Planning

6.4.1 *Prevention of introduction of anophelines* [42]

6.4.1.1 The committee reaffirms its opinion that the most effective safeguard against the introduction of anophelines by ships or aircraft is the rigid enforcement of antimosquito sanitation in and around sea- and airports.

6.4.1.2 The committee further considers that, with respect to countries where mosquito-eradication campaigns have been undertaken, measures of disinsection at present applicable to aircraft should be extended to sea and land traffic from places which are not free from potential malaria vectors, but lays stress on the necessity for instituting further investigations before regulations are formulated for the treatment of ships of heavy tonnage.

---

[40] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

REQUESTS the Director-General to continue his endeavours to facilitate, through the appropriate bodies of the Economic and Social Council, the obtaining of antimalarial supplies requested by the governments ; and further to explore the possibility in the co-operative programme with UNICEF and with the collaboration of the above-mentioned bodies of the Economic and Social Council of aiding the production of basic forms of insecticides and/or their formulations in those non-manufacturing countries in which the necessary preconditions exist for the economical development of such production.

[41] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

REQUESTS the Expert Committee on Insecticides to draft the specifications of the most important insecticides and/or their formulations with a view to circulating them to the governments.

[42] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

REFERS to the Third World Health Assembly the committee's recommendation on prevention of the introduction of anophelines into areas which are free, or have been freed, from them.

6.4.2 The committee recommends that the relative merits and disadvantages of malaria control by residual spraying or by anopheline species eradication should be seriously considered by any country before undertaking an extensive antimalarial programme.

6.4.3 The committee recommends that larval control should be abandoned in rural areas where residual insecticides are found to be effective and are extensively applied.

6.4.4 The committee recommends that the calling of a malaria conference in tropical Africa, sanctioned by the Second World Health Assembly, be given high priority.[43]

6.5 Malaria Activities and Perspectives of WHO [44]

The committee, referring to the long-term objective of WHO's programme in the field of malaria,[45] recommends

---

[43] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

RESOLVES that the Malaria Conference in Equatorial Africa be convened in 1950 if the Director-General is satisfied that the preparations for the conference are adequate.

[44] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

(1) APPROVES the relevant recommendations of the expert committee detailed in subsection 6.5 of the report ; and

(2) RESOLVES :

(*a*) that in any WHO programme of technical assistance to underdeveloped areas where malaria is a major problem, malaria control be given highest priority ;

(*b*) that the first years of a long-term programme should provide for assistance to governments in such a way that all countries where malaria is a major problem be enabled to establish an adequate malaria-control organization, and further, that in every one of these countries at least one malaria-control project be in operation ;

(*c*) that WHO should not hesitate to carry out pilot trials of malaria control by demonstration teams in areas where no previous residual spraying has been done or where previous work leaves the matter of control by this method open to reasonable doubt or even where the identity of the malaria vector has not been proved ;

(*d*) that collaboration with FAO in assisting governments in the control of malaria, where the latter interferes with agricultural and economic development, be intensified ;

(*e*) that WHO provide for the training of selected candidates for antimalaria projects when no suitably trained personnel are otherwise available ;

(*f*) that the demonstration teams, although remaining directly responsible to WHO, should be instructed to fit themselves into the framework of the respective departments of health or of the malaria services if such exist.

[45] *Off. Rec. World Hlth Org.* **18**, 60

6.5.1 that the approach to the ultimate aim should be cautiously planned, that priority should be given to economically underdeveloped malarious countries, and that in the first years of the programme particular attention should be focused on :

6.5.1.1 assisting governments in establishing adequate malaria-control organizations, so that in the near future all malarious countries will have provision for such service, and will have at least one project for malaria control in operation ;

6.5.1.2 developing collaboration with FAO for assisting governments in controlling malaria in food-production areas where malaria interferes with agricultural and economic development ;

6.5.2 that WHO carefully consider the possibility of providing the specialized training of selected candidates for specific positions on field projects when no suitably trained personnel is otherwise available ;

6.5.3 that WHO should not hesitate to carry out pilot trials of malaria control by demonstration teams in areas where no previous residual spraying has been done or where previous work leaves the matter of control by this method open to reasonable doubt or even where the identity of the malaria vector has not been proved ;

6.5.4 that, while the demonstration teams must remain directly responsible to WHO, they should be instructed to fit themselves into the framework of the respective departments of health or of the malaria services, if such exist.

6.5.5 *Draft recommendations to governments*

The committee draws attention to the draft recommendations in section 5.6 and recommends that these be sent by WHO to all Member countries in which malaria is endemic.

6.5.6 *Darling Foundation and Prize*

The committee draws attention to the revised regulations of the Darling Foundation found in Annex 2 and recommends that these be approved by the Executive Board.

Annex 1

LIST OF CORRESPONDING EXPERTS

(10 August 1949)

Alvarado, Dr C. A.	Argentina
Andrews, Dr J.	USA
Annecke, Dr S.	Union of South Africa
Antunes, Dr W. S.	Brazil
Aziz Bey, Mehmed	Cyprus
Bastianelli, Professor G.	Italy
Benitez Armas, Dr S.	Mexico
Boyd, Dr M. F.	USA
Cambournac, Professor F. J. C.	Portugal
Carrasco, Dr C. M.	Bolivia
Chwatt, Dr L. J.	Nigeria
Coatney, Dr G. R.	USA
Fairley, Dr N. H.	United Kingdom
Field, Dr J. W.	Malaya
Ford, Dr E.	Australia
Galindo, Dr P.	Panama
Garnham, Dr P. C. C.	United Kingdom
Geiman, Dr Q. M.	USA
Giglioli, Dr G.	British Guiana
Gillette, Dr H. P. S.	Trinidad
Hackett, Dr L.	Argentina
Iyengar, Dr M. O. T.	India
Janicki, Dr M.	Poland
Livadas, Dr G.	Greece
Macdonald, Professor G.	United Kingdom
Madwar, Dr Saad Allah	Egypt
Missiroli, Professor A.	Italy
Okan, Dr S.	Turkey
Parrot, Professeur L.	Algeria
Pinotti, Dr M.	Brazil
Raffaele, Professor G.	Italy
Rajendram, Dr S.	Ceylon
Rey, Dr H.	Colombia
Rodhain, Professeur J.	Belgium

Schwetz, Professeur J.	Belgium
Senior White, Major R. A.	Trinidad
Stoker, Dr W. J.	Indonesia
Thiel, Professor P. H. van	Netherlands
Trausmiller, Dr. O.	Yugoslavia
Vargas, Dr L.	Mexico
Villalobos, Dr E.	Peru
Viswanathan, Dr D. K.	India
Zoltai, Dr N.	Hungary

Annex 2

REGULATIONS OF THE FOUNDATION FOR THE AWARD OF THE DARLING MEDAL AND PRIZE[1]

(approved by the Executive Board, 17 January 1950)

Article 1

A committee of the World Health Organization styled the " Darling Foundation Committee " shall be formed, and shall be composed of the following members :

the Chairman of the Executive Board of the World Health Organization as such ;

the two Vice-Chairmen of the Executive Board of the World Health Organization as such ;

the Chairman of the Expert Committee on Malaria of the World Health Organization as such, or another member of the Expert Committee designated by him.

The Director-General of the World Health Organization as such shall act as secretary to the committee and as administrator of the Foundation.

Article 2

The Darling Foundation Committee shall, in accordance with the Deed of Foundation and with the present Regulations, award a prize to be known as the " Darling Foundation Prize " to the author of an original work on the pathology, etiology (epidemiology), therapy, or prophylaxis of malaria, recommended by the Expert Committee on Malaria.

Article 3

The Darling Foundation Prize shall consist of a bronze medal and a fixed sum of 1,000 Swiss francs. It shall be awarded whenever the accumulated interest of the Foundation's capital amounts to a net sum of not less than 1,000 Swiss francs, after deducting the total cost of striking the medal.

---

[1] The Executive Board, at its fifth session, adopted the following resolution :

The Executive Board

(1) APPROVES the regulations of the Darling Foundation and Prize as given in an annex to the report of the expert committee ; and

(2) REQUESTS the Director-General to take the necessary action for the modification of the deed of foundation registered with the Conseil d'Etat of the Republic and Canton of Geneva.

Notwithstanding the provisions of this Article and of Articles 5 and 7, the Expert Committee on Malaria may, at its first meeting under these Regulations, recommend the award of two prizes and two medals. All research work published after 1938 may be considered in the award of these two prizes and medals.

Article 4

The administrator shall ascertain twice yearly from the trustee of the Foundation's funds the total amount of the interest accumulated since the last award of the Darling Prize. When the interest amounts to a sufficient sum for a prize to be awarded in accordance with the provisions of Article 3, the administrator shall notify the Member States and Associate Members of the World Health Organization, the members of the Darling Foundation Committee, and the members of the Expert Committee on Malaria.

Article 5

In transmitting notifications under Article 4, the administrator shall invite Member States and Associate Members of the World Health Organization and the members of the Expert Committee on Malaria to put forward, within a period of six months, the name of any person whose candidature is thought worthy of examination with a view to the award of the prize ; the nomination must be accompanied by a written statement of the reasons on which it is based. The same candidature may be submitted on several occasions if unsuccessful.

The candidature must be in respect of a work either published within five years of its submission or submitted still unpublished to the World Health Organization.

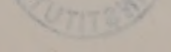
No conditions are made as to the age, sex, profession, nationality, race, or religion of the author.

Article 6

On the expiry of the six months period provided in Article 5, the administrator shall communicate to the members of the Expert Committee on Malaria copies of all nominations received by him. He shall then regard the list as closed.

Article 7

At its first meeting following the communication of the nominations under Article 6, the Expert Committee on Malaria shall discuss in private the relative merits of the candidates nominated and shall recommend to



the Darling Foundation Committee the name of the candidate to whom the medal and the prize should, in the opinion of the committee, be awarded.

Article 8

The Darling Foundation Committee, after considering the nomination of the Expert Committee on Malaria, shall have the power to decide finally, by a majority of the members present, on the award and shall recommend to the Executive Board of the World Health Organization the mode of presentation of the medal and the prize. Three members at least must be present.

Article 9

On the proposal of one of its members or of the Expert Committee on Malaria, the Executive Board may decide to revise the present Regulations.

Article 10

The administrator of the Darling Foundation shall be responsible :

(*a*) for the execution of the decisions taken by the Darling Foundation Committee within the limits of its powers as defined in these Regulations ; and

(*b*) for the observance of these Regulations and generally for the operation of the Darling Foundation as limited by the Deed of Foundation and by these Regulations.

WELLCOME LIBRARY INSTITUTE

WORLD HEALTH ORGANIZATION
TECHNICAL REPORT SERIES

(Separate editions in English and in French)

	Price	
1. Expert Committee on the Unification of Pharmacopoeias : report on the fourth session	9d	$0.10
2. Expert Committee on Biological Standardization : report on the third session	1/6	$0.20
3. Expert Committee on Biological Standardization : report of the Sub-committee on Fat-Soluble Vitamins	9d	$0.10
4. Expert Committee on Insecticides : report on the first session	*To be published*	
5. Expert Committee on Health Statistics : report on the first session	9d	$0.10
6. Active immunization against common communicable diseases of childhood	1/3	$0.15
7. Expert Committee on Tuberculosis : report on the fourth session	1/3	$0.15
8. Expert Committee on Malaria : report on the third session	2/3	$0.30
9. Expert Committee on Mental Health : report on the first session	2/3	$0.30
10. Expert Committee on Environmental Sanitation : report on the first session	2/-	$0.25
11. Expert Committee on Plague : report on the first session	*To be published*	
12. Expert Committee on the Unification of Pharmacopoeias : report on the fifth session	9d	$0.10
13. Expert Committee on Venereal Infections : report on the third session 14. Expert Committee on Venereal Infections : report of the Subcommittee on Serology and Laboratory Aspects	*To be published*	
15. Veneral-disease control in the USA : report of the WHO Syphilis Study Commission	3/6	$0.45
16. Joint FAO/WHO Expert Committee on Nutrition 17. Joint OIHP/WHO Study-Group on African Schistosomiasis : report on the first session 18. Joint OIHP/WHO Study-Group on Cholera ; report on the third session 19. Yellow-Fever Panel : report on the first session 20. Expert Committee on International Epidemiology and Quarantine : report on the second session	*To be published*	
21. Expert Committee on Drugs Liable to Produce Addiction : report on the second session	9d	$0.10

Bulk Orders

A discount of 20% will be given to health organizations for orders of 100 copies or more. Such orders should be sent direct to the World Health Organization, Sales Section, Palais des Nations, Geneva, Switzerland.

WHO publications are on sale at the following addresses :

ARGENTINA
Editorial Sudamericana, S. A.
Calle Alsina 500
BUENOS AIRES

AUSTRALIA
H. A. Goddard Pty, Ltd
255*a* George Street
SYDNEY

BELGIUM
Agence et Messageries de la Presse, S. A.
14-22 rue du Persil
BRUSSELS

BOLIVIA
Librería Científica y Literaria
Avenida 16 de Julio 216
Casilla 972
LA PAZ

CANADA
The Ryerson Press
299 Queen Street West
TORONTO, Ontario

CHILE
Edmundo Pizarro
Merced 846
SANTIAGO

CHINA
The Commercial Press, Ltd
211 Honan Road
SHANGHAI

COLOMBIA
Librería Latina, Ltda
Apartado Aéreo 4011
BOGOTÁ

COSTA RICA
Trejos Hermanos
Apartado 1313
SAN JOSÉ

CUBA
La Casa Belga
René de Smedt
O'Reilly 455
HAVANA

CZECHOSLOVAKIA
Librairie F. Topič
Národní Třida 9
PRAGUE I

DENMARK
Librairie internationale
Einar Munksgaard
Nørregade 6
COPENHAGEN

DOMINICAN REPUBLIC
Librería Dominicana
Calle Mercedes 49, Apartado 656
CIUDAD TRUJILLO

ECUADOR
Muñoz Hermanos y Cía
Nueve de Octubre 703
Casilla 10-24
GUAYAQUIL

EGYPT
Librairie " La Renaissance d'Egypte "
9 Sharia Adly Pasha
CAIRO

FINLAND
Akateeminen Kirjakauppa
Keskuskatu 2
HELSINKI

FRANCE
Editions A. Pedone
13 rue Soufflot
PARIS, 5e

GREECE
Librairie internationale
" Eleftheroudakis "
Place de la Constitution
ATHENS

GUATEMALA
Goubaud y Cía, Ltda, Sucesor
5a Av. Sur, N° 6 y 9*a*, C.P.
GUATEMALA

HAITI
Max Bouchereau
Librairie " A la Caravelle "
Boîte postale 111-B
PORT-AU-PRINCE

INDIA
Oxford Book & Stationery Co.
Scindia House
NEW DELHI

IRAN
Bongahe Piaderow
731 Shah Avenue
TEHERAN

IRAQ
Mackenzie's Bookshop
BAGHDAD

LEBANON
Librairie Universelle
BEIRUT

LUXEMBURG
Librairie J. Schummer
Place Guillaume
LUXEMBURG

NETHERLANDS
N. V. Martinus Nijhoff's Boekhandel en Uitgevers Maatschappij
Lange Voorhout 9
THE HAGUE

NEW ZEALAND
The United Nations Association of New Zealand
1011 G.P.O.
WELLINGTON

NORWAY
Johann Grundt Tanum Forlag
Kr. Augustsgt. 7A
OSLO

PHILIPPINES
D. P. Pérez Co.
132 Riverside
SAN JUAN

SWEDEN
Aktiebolaget C. E. Fritzes Kungl. Hovbokhandel
Fredsgatan 2
STOCKHOLM 16

SWITZERLAND
Librairie Payot, S. A.
LAUSANNE, BALE, BERNE, GENEVA, MONTREUX, NEUCHATEL, VEVEY, ZÜRICH
Librairie Hans Raunhardt
Kirchgasse 17
ZÜRICH 1

SYRIA
Librairie Universelle
DAMASCUS

TURKEY
Librairie Hachette
469 av. de l'Indépendance
ISTANBUL

UNION OF SOUTH AFRICA
Van Schaik's Bookstore
Booksellers and Stationers
PRETORIA

UNITED KINGDOM
H.M. Stationery Office
P.O. Box 569
LONDON S.E.1

UNITED STATES OF AMERICA
Columbia University Press
International Documents Service
2960 Broadway
NEW YORK 27, N.Y.

URUGUAY
Librería Internacional S. R.
Héctor D'Elía
Calle Uruguay 1331
MONTEVIDEO

VENEZUELA
Escritorio Pérez Machado
Conde a Piñango 11
CARACAS

YUGOSLAVIA
Državno Preduzeče
Jugoslovenska Knjiga
Maršala Tita 23/II
BELGRADE

Orders may also be addressed to

WORLD HEALTH ORGANIZATION

Sales Section, Palais des Nations, Geneva, Switzerland